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# The use of AI in autonomous agriculture

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## I. Abstract:-

Autonomous farming, because of this farming with the assist of machines and clever technology, is getting better and better because of new generation like AI and robots. This type of farming can make farming more green and green and might produce more meals to satisfy the arena's developing starvation. This precis explains the main ways AI helps in independent farming. AI makes use of smart generation like machine studying, laptop imaginative and prescient, and sensors

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to make farming higher. It can be utilized in all components of farming, from planting to harvesting.

Precision Farming: AI helps farmers with the aid of using drones, self-driving tractors, and sensors to look at over the crops and the soil. AI can speedy decide a way to use water and different resources to get the best crop.

Weed and Pest Control: AI can find and kill weeds and pests. It also can inform the difference among plants and weeds, so farmers can use fewer chemical substances to guard their crops.

Harvesting: Robots that use AI can pick out only the ripe crops, which saves money and time and makes much less waste.

Smart Choices with Data: AI helps farmers make smart alternatives by means of looking at statistics. It tells farmers how properly their crops did inside the past, what the climate can be like, and what humans need to shop for. This helps farmers do a higher activity.

Managing Deliveries: AI allows manage the vehicles and ships that move plants to the stores. It choices the fine routes and instances to supply vegetation, so there may be much less waste and people get fresh meals.

Eco-Friendly Farming: AI could make farming better for the surroundings. It makes use of fewer assets and makes much less waste, which is good for the planet.

Using AI in self sustaining farming has many benefits, like growing extra food, desiring fewer people to paintings at the farm, and the usage of assets wisely.

## II. Keywords:-

Autonomous Agriculture, Precision Farming, Artificial Intelligence, Machine Learning, Computer vision, Robotics.

## III. Introduction:-

The use of Artificial Intelligence (AI) in self reliant farming is changing how we grow crops and run farms. Farming has always been an crucial part of our records, and as the sector's populace grows, we want to produce extra meals whilst taking care of the surroundings. AI, that's like smart computer generation, is assisting us locate new and smart approaches to do that. In the antique days, people did maximum of the work on farms and made selections based totally on what they noticed. But now, AI is making things less complicated by means of using machines and data to make farming greater unique.

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Artificial Intelligence (AI): AI method coaching computer systems to do smart matters that normally people do, like fixing issues or getting to know from information. In farming, AI makes use of such things as device getting to know and statistics evaluation to make farms work higher.

Autonomous Agriculture: This is whilst AI and robots do most of the paintings on a farm without needing masses of humans. It makes farming more efficient and saves on hard work charges.

**Here are the great things about the usage of AI in farming:**

More Crops: AI helps us grow extra vegetation via the usage of data to plant, water, and harvest them simply right.

Less Waste: AI helps us use things like water and fertilizers extra wisely, so we do not waste them and damage the surroundings.

Precise Farming: AI is sort of a smart map for the fields, displaying what every part of the farm needs, like extra or less water or vitamins.

Watching Crops: Drones and smart sensors with AI can have a look at the crops, take a look at for issues, and tell us early if something is going incorrect.

Smart Decisions: AI collects and studies records from special resources to help farmers make correct picks approximately what to plant, while to harvest, and the way to deal with pests.

## IV. Literature review:-

AI in self sufficient agriculture is a swiftly growing subject that may exchange the manner we grow food. AI uses technology like system mastering, laptop vision, and robots to assist farmers in numerous approaches. Here's a easy rationalization of what's going on:

Precision Farming: AI facilitates farmers be greater unique in how they water, fertilize, and shield their plants. It makes use of statistics from sensors, drones, and satellites to reduce waste and make plants higher.

1. Checking Crops and Stopping Diseases: AI can study photos of plants and discover problems like illnesses or no longer enough meals. This enables farmers restore problems speedy and keep away from using too many chemical substances.
2. Self-Driving Machines: Machines like self-riding tractors and drones can plant seeds, pick out crops, and use fertilizer by way of themselves. This saves money and time.

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3. Managing Weeds: AI can inform the difference between plants and weeds and only use weed killers in which wished. This helps the surroundings.
4. Smart Decision-Making: AI makes use of a lot of statistics from farms, like weather and soil data, to help farmers make higher choices approximately what to grow and whilst to plant.
5. Predicting the Future: AI can bet what number of vegetation you may get and what problems may take place, like awful climate. This allows farmers plan higher.
6. Managing the Food Journey: AI enables ensure food receives from the farm on your plate thoroughly and with out wasting too much.
7. Saving the Earth: AI enables farmers use fewer assets and chemicals, which is right for the surroundings.
8. Challenges: There are troubles like preserving records non-public, fitting AI into how farmers already paintings, and making sure every person can use it, specifically in rural regions.

## V. Previous Work:-

The crop management strategies are enumerated. Sowing is the first step in crop management, which also includes crop harvesting, crop storage, and distribution.it can be summed upas actions that increases the yield and growth of agricultural products. Crop yield will undoubtedly increases with a thorough understanding of the class of crops according to their timing andthriving soil types. An agricultural management system called precision crop management targets crop and soil input based on field needs to maximize profitability and safeguard the environment. Lack of timely, widely disseminated information on crop and soil condition has hampered. In order to deal with a water deficit brought on by the soil, the weather, or insufficient irrigation, farmers must combine a variety of crops management technique. System for adaptable crop management. The decision-making process that leads to a heigh and heigh quality crop yield can be aided by having a proper understanding of weather patterns. For assessing how a farm system will behave operationally, consider its capacities labor availability, and data on authorized and prioritized operators, tractors, and implements. Additionally, it provides estimates for crop production, gross income, and net profit for both the entire farm and individual field. By sensing various soil parameters and parameters related to atmosphere, crop prediction methodology is used to predicts the appropriate crop. Soil type, PH, nitrogen, phosphate, potassium, magnese and iron as well as depth, temperature, precipition, and humidity are some examples of such factors. Demeter is a speed-

rowing devicw that is computer-controlled and outfitted with two video cameras and a global positioning system.

## VI. Result:-

The use of AI in farming has turn out to be quite important these days as it has the ability to make farming an awful lot better. AI technologies, like clever computer packages, are being used in extraordinary elements of farming to make it paintings better. Here are a few important matters we've got found out from studies about AI in farming:

Precision Agriculture: AI enables farmers do a better process through using computer systems to collect and examine facts from such things as sensors, drones, and satellites. This facilitates farmers make smart decisions approximately things like when to plant, how plenty water and fertilizer to use, and how to maintain pests away. This makes vegetation grow better and makes use of resources extra wisely.

Checking Crops and Finding Problems: AI computer structures can look at crops and parent out if they're healthful or if there are problems like bugs or no longer sufficient vitamins. This helps farmers repair problems early and reduce the need for chemical compounds, making the vegetation better.

Getting Rid of Weeds: Robots with AI can discover and put off weeds in fields with out assist from human beings. This manner much less want for weed-killing chemical substances and more area and resources for vegetation to develop.

Picking and Sorting Fruits and Veggies: Robots with AI can choose ripe culmination and veggies and sort them effectively. This makes farming more green, reduces hard work fees, and method much less meals goes to waste.

Checking Soil and Nutrients: AI facilitates examine soil and recommends how tons fertilizer to use. This facilitates improve the first-class of vegetation and is ideal for the surroundings.

Predicting Weather and Adapting to Climate: AI can are expecting the weather and deliver advice on a way to deal with converting weather situations. This is critical for planning while to plant and harvest crops and use assets accurately.

Robotic Farm Machines: Machines that could work on their personal with the assist of AI and GPS

can do farming responsibilities like plowing and harvesting without having people. They can paintings all day and night, which makes farms greater green.

Using Data and Making Good Choices: AI structures use data from extraordinary assets like weather and soil sensors to present farmers actual-time recommendation and help them make smarter decisions. This manner much less waste and higher farming.

Predicting What People Want and Making Food Delivery Better: AI can guess what human beings will want to shop for and help determine out a way to get meals to shops in a higher way, so we do not waste as lots meals.

Challenges and Things to Keep in Mind: Research also tells us that there are demanding situations and matters to consider whilst using AI in farming. These include keeping information safe, ensuring absolutely everyone can use these technologies, and considering how it would affect jobs. While AI could make farming higher, we also need to be cautious and think about the troubles and moral troubles which can come up.

## VII. Conlcusion:-

AI in self sustaining farming can be a large assist for farmers and food manufacturing. AI makes farming greater green. It can manipulate obligations like planting and harvesting very precisely, saving resources and making farming better. AI offers actual-time data approximately plants, supporting farmers make appropriate selections about such things as fertilizers and water. This makes plants healthier and yields bigger. AI can make farming extra green. It allows use sources like chemicals and water more cautiously, which is good for the environment. With AI, machines can do the difficult work on the farm, so farmers do not have to do all of the difficult tasks. This can assist with the lack of farm workers. AI creates plenty of statistics that farmers can use to make their farms better. They can change how they do matters based in this information. But there are problems too. We want to keep facts secure, shield in opposition to cyber-assaults, and make sure every person can use AI in farming, now not just big farms. Also, AI can be steeply-priced for small farmers.We want to maintain improving AI in farming, making better era, and making sure it works in all areas, even in remote places. In brief, AI in farming could make it extra efficient and green, however we need to solve some issues and ensure all farmers can benefit from it. With greater innovation and cautious use, AI can assist with food security and modern-day farming challenges.

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## VIII. Future scope:

By 2050, the population of the world is predicted to exceed nine billion, necessitating a 70% increases in agricultural output to meet the demand just about 10% of this increased production might come from underutilized land, with the remaining 90% being met by intensifying current production. using the most recent technological innovations to increases farming efficiency is still a crucial requirement in this contex. the market demands high- quality food , and current strategies for intensifying agriculture production require high energy inputs. Robotics and autonomous system will revolutionize numerous industries around the world. Large economic sectors with low productivity, such as agro-food,will be greatly impact by these technologies.

AI in self sufficient agriculture, frequently known as "smart farming," holds top notch promise in reworking food manufacturing. It uses AI technologies like gadget studying and drones to help farmers manipulate their fields higher, making use of fertilizers and insecticides precisely, lowering useful resource wastage, and boosting crop yields. Autonomous equipment, inclusive of AI-driven tractors and harvesters, can paintings around the clock, reducing labor prices. Predictive analytics and AI can resource in making statistics-driven decisions for farming. Soil health and livestock control, weather resilience, and deliver chain optimization also are stepped forward with AI. It promotes sustainable farming, information sharing, and regulatory compliance, in the long run improving farmers' access to global markets. However, its fulfillment depends on infrastructure, farmer education, and addressing ethical and privateness issues in agriculture.

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## References:-


1. Shadrin, D., Menshchikov, A., Somov, A., Bornemann, G., Hauslage, J., & Fedorov, M. (2019). Enabling precision agriculture through embedded sensing with artificial intelligence. IEEE Transactions on Instrumentation and Measurement, 69(7), 4103-4113.
2. Shadrin, D., Menshchikov, A., Ermilov, D., & Somov, A. (2019). Designing future precision agriculture: Detection of seeds germination using artificial intelligence on a low-power embedded system. IEEE Sensors Journal, 19(23), 11573-11582.
3. R Shamshiri, R., Weltzien, C., Hameed, I. A., J Yule, I., E Grift, T., Balasundram, S. K., ... & Chowdhary, G. (2018). Research and development in agricultural robotics: A perspective of digital farming.
4. Eli-Chukwu, N. C. (2019). Applications of artificial intelligence in agriculture: A review. Engineering, Technology & Applied Science Research, 9(4).
5. Duckett, T., Pearson, S., Blackmore, S., Grieve, B., Chen, W. H., Cielniak, G., ... & Yang, G. Z. (2018). Agricultural robotics: the future of robotic agriculture. arXiv preprint arXiv:1806.06762.
6. Bacco, M., Barsocchi, P., Ferro, E., Gotta, A., & Ruggeri, M. (2019). The digitisation of agriculture: a survey of research activities on smart farming. Array, 3, 100009.
7. Sowjanya, K. D., Sindhu, R., Parijatham, M., Srikanth, K., & Bhargav, P. (2017, April). Multipurpose autonomous agricultural robot. In 2017 International conference of Electronics, Communication and Aerospace Technology (ICECA) (Vol. 2, pp. 696-699). IEEE.
8. Marinoudi, V., Sørensen, C. G., Pearson, S., & Bochtis, D. (2019). Robotics and labour in agriculture. A context consideration. Biosystems Engineering, 184, 111-121.
9. Rad, C. R., Hancu, O., Takacs, I. A., & Olteanu, G. (2015). Smart monitoring of potato crop: a cyber-physical system architecture model in the field of precision agriculture. Agriculture and Agricultural Science Procedia, 6, 73-79.
10. Lu, Y. (2019). Artificial intelligence: a survey on evolution, models, applications and future trends. Journal of Management Analytics, 6(1), 1-29.
11. Kim, J., Kim, S., Ju, C., & Son, H. I. (2019). Unmanned aerial vehicles in agriculture: A review of perspective of platform, control, and applications. Ieee Access, 7, 105100-105115.
12. Ayaz, M., Ammad-Uddin, M., Sharif, Z., Mansour, A., & Aggoune, E. H. M. (2019). Internet-of-Things (IoT)-based smart agriculture: Toward making the fields talk. IEEE access, 7, 129551-129583.


http://doi.org/10.36893/JNAO.2023.V14I1.077-086

13. De Simone, M. C., Rivera, Z. B., & Guida, D. (2018). Obstacle avoidance system for unmanned ground vehicles by using ultrasonic sensors. Machines, 6(2), 18.
14. Hameed, I. A., la Cour-Harbo, A., & Osen, O. L. (2016). Side-to-side 3D coverage path planning approach for agricultural robots to minimize skip/overlap areas between swaths. Robotics and Autonomous Systems, 76, 36-45.
15. Smith, M. J. (2018). Getting value from artificial intelligence in agriculture. Animal Production Science, 60(1), 46-54.
16. Jain, B.B., Upadhyay, H. and Kaushik, R., 2021. Identification and Classification of Symmetrical and Unsymmetrical Faults using Stockwell Transform. *Design Engineering*, pp.8600-8609.
17. Rajkumar Kaushik, Akash Rawat and Arpita Tiwari, "An Overview on Robotics and Control Systems", *International Journal of Technical Research & Science (IJTRS)*, vol. 6, no. 10, pp. 13-17, October 2021.
18. Simiran Kuwera, Sunil Agarwal and Rajkumar Kaushik, "Application of Optimization Techniques for Optimal Capacitor Placement and Sizing in Distribution System: A Review", *International Journal of Engineering Trends and Applications (IJETA)*, vol. 8, no. 5, Sep-Oct 2021.
19. Guru Saran Chayal, Bharat Bhushan Jain and Rajkumar Kaushik, "A Detailed Study of Electrical Vehicle with Improved Applications: A Review", *International Journal of Engineering Trends and Applications (IJETA)*, vol. 8, no. 6, pp. 31, Nov-Dec 2021.
20. Sharma, R., Kaushik, M. and Kumar, G. (2015) “Reliability analysis of an embedded system with multiple vacations and standby”, International Journal of Reliability and Applications, Vol. 16, No. 1, pp. 35-53.
21. Kaushik, M. and Kumar, G. (2015) “Markovian Reliability Analysis for Software using Error Generation and Imperfect Debugging” , International Multi Conference of Engineers and Computer Scientists 2015, vol. 1, pp. 507-510.